

ELK AND MOOSE WOUNDS ON ASPEN STEMS IN
WYOMING AS PENETRATION POINTS FOR CANKER FUNGI:
1987 REPORT

J. H. Hart
D. L. Hart

Elk and Moose Wounds on Aspen Stems in Wyoming as Penetration

Points for Canker Fungi, 1987 Report

J.H. Hart and D.L. Hart
Departments of Forestry and Botany & Plant Pathology
Michigan State University

In cooperation with

U.S. Department of Agriculture, Forest Service
Rocky Mountain Forest and Range Experiment Station
Fort Collins, Colorado 80526

and

Bridger-Teton National Forest
Jackson, Wyoming 83001

LIBRARY COPY
ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION

Cervid barking as penetration points for canker fungi

There is a difference of opinion as to the importance (Krebill - important, Hinds - not important) of elk stem wounds as entry points for canker fungi. Both Krebill (1972) and Hinds (Walters et al. 1982) as well as others have mentioned the possibility that moose wounds may be much more suitable for colonization than elk wounds due to the depth of the wound and the season of the year (elk, winter; moose, spring-summer-fall) when most damage occurs. Due to some fortuitous events the importance of wounds made by moose and elk can be independently determined.

Elk Wounds

The winter of 1983-84 was especially severe in western Wyoming, and elk were fed near the Heart-6 Ranch, an area where elk had not previously wintered. Hence the aspen stems in this area were free of stem scars prior to the feeding program. The stems in the immediate area of feeding were severely damaged in early 1984, but nearby (300m) clones were not attacked. No significant reinjury occurred during 1985, 1986 or 1987. Although moose winter commonly in the willow flats below the feedground, they were not reported in the area where the elk were being fed. Hence we have a healthy aspen stand that was severely attacked at one point in time, apparently by elk only.

Seven 0.02-ha plots were established in July 1985 in the injured (feedground) and in the nearby uninjured clones. All stems 2.5 to 15 cm dbh were counted and a code symbol painted on them to indicate their condition (healthy, healthy-elk injured, dead from elk injury-stems 100% girdled, dead from canker fungi following elk injury-stem less than 100% girdled, and dead from other causes). Stems over 15 cm dbh were numbered and the amount (none,

light, medium, heavy) of elk injury and the presence of any pathogens or insect damage were recorded. All stems were examined again in July 1986 and August 1987 and their condition recorded.

Moose Wounds

Although the Goosewing exclosure (Gros Ventre watershed) has been subject to periodic foraging by cervids, most injury appears to have occurred at least ten years prior to 1985. However, during the spring of 1985 moose broke a hole in the fence and scarred a number of stems, with minor use continuing during the summer and early fall. Temporary repairs were made to the fence in September 1985 but some new injury did occur between 19 September 1985 and 15 July 1986 and between July 1986 and August 1987. It appears that the 1986 and 1987 injury was the result of a single feeding episode each spring. In each case the wounds all appeared to be of the same age. By July 1986 and August 1987, callus tissue had formed along the wound margins.

In September 1985 dbh, percent of circumference girdled, length and width of the largest wound, number of wounds and approximate date of wounding were recorded for 80 recently-scarred (1985) stems. The dbh was also determined for 80 uninjured stems, and all 160 stems were permanently numbered. Pictures were taken of some stems. During July 15-17, 1986, and August 30-31, 1987, the same data were collected plus the development of any pathogens noted. All but a few wounds were photographed each year. Similar data were recorded for 26 1986-injured stems (four of which had been control stems in 1985) and 5 1987-injured stems.

Results

Elk Wounds

From the data collected in 1985, it was estimated there were 423 stems 2.5-15cm dbh alive in the seven feedground plots in 1984 and 357 live stems in

the seven control plots (Table 1). In 1984, 82% (347/428) and 1.7% (6/357) of the stems received elk injury in the feedground and control plots, respectively. 28% (97/347) of the injured stems had died in the feedground plots by 1985; the mortality dropped to 11% in 1986 and 1987 (Table 2). Mortality rates varied from 1.4% to 8.5% per year for the uninjured stems in the feedground area and from 5 to 14% per year in the control area (Table 2). Cumulative mortality (1984 to 1987) was 43% for injured stems compared to 14% and 21% for uninjured stems in the feedground and control areas, respectively (Table 1).

The bulk of the first-year mortality of injured stems (72%) was the result of elk barking completely girdling the stem; the remaining mortality in 1985 and nearly all of the mortality in 1986 and 1987 was the result of elk wounds being colonized by canker fungi. Valsa sordida (Cytospora chrysosperma) was the pathogen present except for one case in 1986 when Cenangium singulare was identified. In addition, 61 of the 198 wounded stems still alive in 1987 in the feedground plots had active Cytospora cankers in 1987.

There were 127 and 125 live stems over 15 cm dbh on the feedground and control plots, respectively (Table 3). Ten stems over 15 cm dbh died between 1985 and 1986 but only one death resulted from colonization of an elk wound by a pathogenic fungus (Cenangium). Five more stems died in 1987, but none died from cankers associated with elk damage. Cumulative mortalities (1985-1987) of healthy and elk-damaged stems were 3% (5/145) and 4% (3/83), respectively. Only stems with a history of cankers prior to initiation of the study had significantly higher death rates-29% (7/24). Total two-year mortality for all stems was 6%.

Moose Wounds

Wounds on 41 of the 72 stems injured in the spring of 1985 had developed

cankers by 1986 (Table 4). By 1987 cankers had become inactive in four stems. None of 31 wounded stems which had not developed cankers by 1986 developed cankers in 1987. No stems died during 1987 (Table 4). Wounds on stems with active cankers failed to close while uninfected wounds or wounds which excluded the pathogen during 1987 were reduced in size (Table 5).

By 1986 one canker had formed on one of the 8 stems injured in September 1985. By 1987 four of the stems had developed cankers and one had died from a canker infection that formed at a moose wound.

Table 1. Mortality of aspen stems 2.5-15 cm dbh uninjured and injured by elk between 1984 and 1987, Heart-6 Ranch, Wyoming.

	Feedground				Control			
	<u>Total</u>	<u>Alive</u>	Died	%	<u>Total</u>	<u>Alive</u>	Died	%
	1984	1987	84-87	mortality	1984	1987	84-87	mortality
Not injured	76	65	11	14%	351	278	73	21%
Injured by elk	347	198	148	43%	6	6	0	0

Table 2. Mortality rate (% dying each year) of aspen stems 2.5-15 cm dbh uninjured and injured by elk in 1984.

	Feedground			Control		
	1985	1986	1987	1985	1986	1987
Not injured	6.6	1.4	8.5	6	14	5
Injured by Elk	28	11	11	-	-	-

Seven of the 26 stems injured in the spring of 1986 had become infected with canker fungi by 1987 (Table 6). Wounded stems which developed cankers in 1987 had larger wounds and a greater percentage of the trunk circumference girdled in 1986 than injured stems which did not develop cankers (Table 6). Infected wounds failed to close while uninfected wounds decreased in size. These results are similar to those reported in last year's report (Table 4) for stems injured in the spring of 1985. In all cases the only pathogen observed was Cytospora chrysosperma.

Literature Cited

1. Krebill, R.G. 1972. Mortality of aspen on the Gros Ventre elk winter range. USDA Forest Service Research Paper INT-129. 16 p.
2. Walters, J.W., T.E. Hinds, D.W. Johnson and J. Beatty. 1982. Effects of partial cutting on diseases, mortality, and regeneration of Rocky Mountain aspen stands. USDA Forest Service Research Paper RM-240. 12 p.

Table 3. Condition of aspen stems over 15 cm dbh uninjured and injured by elk during early 1984 (Heart-6 Ranch, Wyoming), number of stems.

Condition 1985	Feedground					Control				
	<u>No. alive</u>			<u>No. died</u>		<u>No. alive</u>			<u>No. died</u>	
	1985	1986	1987	1986	1987	1985	1986	1987	1986	1987
Healthy	23	22	22	1	0	122	120	118	2	2
Light elk damage	30	30	30	0	0	1	1	1	0	0
Moderate elk damage	22	22	20	0	2	-	-	-		
Heavy elk damage	30	29	29	1	0	-	-	-		
Cankers present prior to 1984; not associated with elk injury	22	16	16	6	0	2	2	1	0	1

Table 4. Mortality rates and canker development on aspen stems (Goosewing Exclosure) injured by moose in the spring of 1985 or 1986.

Treatment	No. of stems	<u>No. with cankers</u>		<u>No. died</u>	
		1986	1987	1986	1987
Wounded, 1985	72	41	37	1	0
Wounded, 1986	26	-	7	-	0
Controls	75	0	0	1	0

Table 5. Percent of trunk girdled by moose wounds and subsequent invasion by canker fungi for 72 spring 1985 wounds on aspen stems (Goosewing Exclosure).

Treatment	No. of stems	<u>% of trunk circumference girdled</u>		
		1985	1986	1987
Wounded, no cankers 1986 or 1987	31	33	30	18
Wounded, active canker both 1986 and 1987	37	42	49	46
Wounded, active canker in 1986 but none in 1987	4	26	36	23

Table 6. Comparison of aspen stems injured by moose in the spring of 1986 which did and which did not develop cankers by 1987.

	Developed cankers n = 7	No cankers n = 19
Average dbh	5.2 cm	6.3 cm
% girdled, 1986	49.6%	36.4%
% girdled, 1987	47.9%	27.4%
Average size of largest wound, 1986	434 cm ²	187 cm ²
Average no. of wounds, 1986	3.6	3.7